

Analytical Evaluation of College Learning Experiences on Students' Problem-Solving Efficacy among Technical and Scientific Areas

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ABSTRACT

Problem-solving is important for students to become effective problem solvers in their profession, and for later career success. This study was conducted to explore how learning experiences affect problem-solving efficacy of Vietnamese college students within technical and scientific areas. The study used a questionnaire survey with 430 students' technical and scientific areas from three member universities at Vietnam National University of Ho Chi Minh City. Results of this study indicated that students' problem-solving efficacy was within the range of "average" to "high" response. There existed significant differences of problem-solving efficacy of students among the three universities. Various learning experiences of teaching approach, and learning engagement influenced as significant factors affecting students' problem-solving efficacy.

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1. INTRODUCTION

Higher education in Vietnam has greatly expanded in the past two decades. It has gradually improved in terms of size, types of institutions and forms of training, meeting the demand of the socio-economic development. However, higher education is facing big challenges: government loses authority controlling higher education institutions and does not facilitate or promote the improvement of training quality of the whole system. According to Thomas and Ben (2008), Vietnamese students and international investors cite the lack of skilled workers and managers as a major barrier to expansion. The proportion of Vietnamese students who acquired other skills is very low, mostly under thirty per cent (Luong, 2010).

One of the objectives of higher education in Vietnam is to cultivate students' practical competencies (Law of Education, 2005). Student efficacy development has been increasingly emphasized in the process of setting educational objectives as well as designing curriculum and learning materials in higher education in Vietnam (Nguyen, 2009). Thus, success has been an issue broadly discussed and defined by different approaches. The literature encouraged that the development of problem-solving efficacy are necessary for career success (Gustin, 2001; Zekeri, 2004). Problem-solving is such an important efficacy that it focuses on its students becoming effective problem solvers by applying logical, critical and creative thinking to a range of problems (Wilson, 1993). Problem-solving can provide the site for learning new concepts and for practicing learned skills (Kilpatrick, Swafford, & Findell, 2001). The development of problem-solving efficacy is therefore an important mission for faculty to develop for their students (Pajares & Kranzler, 1995). Sirin and Güzel (2006) showed that it was found that problem-solving efficacy had a positive relationship with reflective observation learning style and a negative relationship with abstract conceptualization learning style. Little and Hefferan (2000) provided clear strategies on how to develop students' development of legal

problem-solving efficacy. Effective problem-solving efficacy are best learned in an environment in which the student is free to test thinking skills, explore alternatives, and discover solutions that may or may not match the instructor's solution (May & Newman, 1980).

Research recognizes that students who frequently practice active learning perceive themselves gaining knowledge and skills from their college education and view their college experiences as rewarding (Braxton et al., 2000). Although college students acquire knowledge and skills primarily through curriculum learning contributes to college student outcomes (Wu, 2012). According to Breiter, Clements and Pavesic who are emphasized the importance of problem-solving efficacy as the key focus of future curriculum (Breiter & Clements, 1996; Pavesic, 1991) and considered as the heart of learning (Schommer-Aikins, Duell, & Hutter, 2005). As a sequence of learning opportunities, curriculum has several aspects and indications such as plans and intentions, patterns of classroom activities, and textbooks (Schmidt et al., 2001). College recognizes the importance of creating safe and open classroom environments to foster students learning and development. The curriculum can contribute to valued outcomes of college students (Bowen, 1977; Chickering & Rieser, 1993). According to Braskamp et al., (2006) curriculum is a fundamental component of a college commitment to holistic student development and what and how students learn which are interdependent. Problem-solving efficacy has become the means to rejoin content and application in a learning environment for basic skills and their application in various contexts. Today, there is a strong movement in education to incorporate problem-solving as a key component of the curriculum (Krikley, 2003)

In general, learning experience is a sequence of learning opportunities provided to students in their study and contributes to the development of student's competence. Despite the elaboration of the importance of problem-solving efficacy to college students in previously stated research, unfortunately, there is a lack of the literature on college students' problem-solving competence and curriculum learning in Vietnam. Thus, the primary purpose of the present study was to explore how learning experiences affect problem-solving efficacy of Vietnamese college students. In view of the aforesaid points, this study seeks to address the following questions:

1. Do students' technical and scientific areas differ in their problem-solving efficacy? And How?
2. How are technical and scientific areas students of problem-solving efficacy affected by their college learning experiences?

2. METHODOLOGY

2.1. Sample

This study was selected random sample of 403 students from three member universities at Vietnam National University of Ho Chi Minh City (VNU-HCM) including 253 students of the University of Technology (37.9% female students), 143 students of the University of Science (46.86% female students), and 34 students of the University of Information Technology (29.4% female students). Participants in this study were third year students who were studying on campus, full time students. According to Huang and Chang (2004), the third year students are considered the best population for observing student involvement and development at the university.

2.2. Instrument

This study use questionnaire survey to gather data. The survey is the most widely used data gathering in the social sciences (Neuman, 2006). The independent variables in this study included three variable blocks: student backgrounds, teaching approach, and learning engagement. The problem-solving efficacy dependent variable was constructed from four characteristics were: (1) data analysis efficacy, (2) critical thinking efficacy, (3) present solution efficacy, and (4) generate innovation efficacy. Factor analysis revealed that all four competences had factor loading (0.690 – 0.856) greater than threshold level of 0.6, and Cronback's α coefficients 0.798, which is significantly higher than the 0.6 principal guideline and indicating satisfactory reliability for this student competence measurement (Hair et al., 2006).

2.3. Data Analysis Method

This study used SPSS 13.0 software to process the data analysis. The statistical methods employed to answer two research questions. Descriptive analysis and analysis of variance (ANOVA) were used to answer the first research question of "Do students' technical and scientific areas differ in their problem-solving efficacy? And How?", and multiple regression method was used to answer the second research question of "How are technical and scientific areas students of problem-solving efficacy affected by their college learning experiences?"

3. RESULTS AND DISCUSSION

3.1. Vietnamese students' technical and scientific areas in their problem-solving efficacy

For the first research question, using the descriptive analysis to answer how Vietnamese students' technical and scientific areas in their problem-solving efficacy and using the ANOVA to answer "Do students' technical and scientific areas differ in their problem-solving efficacy?" As shown in Table 2, Vietnamese college students' average problem-solving efficacy ($M = 3.41$, $SD = 0.55$) was located within the range of the response of "average" (point 3) to "high" (point 4) in the 5-point Likert's scale employed in the questionnaire.

Table 1. ANOVA, Means and Standard Deviations results of college students' problem-solving efficacy among three universities

VNU-HCM members	<i>M</i>	<i>SD</i>	<i>F</i>	<i>Sig.</i>	<i>Post-hoc</i>
Average of three universities	3.39	0.56			
1. University of Technology	3.51	0.50	18.12	.000	
2. University of Information Technology	3.06	0.55			
3. University of Science	3.25	0.60			(1) > (2,3)

For students at the three campuses of VNU-HCM, the results of Table 1 exhibited that students at the University of Technology had the highest problem-solving efficacy ($M = 3.51$, $SD = 0.50$), and students at the University of Information Technology had the lowest problem-solving efficacy ($M = 3.06$, $SD = 0.55$). The results of post-hoc comparisons showed that there existed significant differences of problem-solving efficacy of students among the three universities ($F = 18.12$, $p < 0.001$). Post-hoc comparisons indicated that students at the three universities can be categorized into two groups: high level of problem-solving efficacy of students in the Universities of Technology; low level of problem-solving efficacy of students at the University of Information Technology, and the University of Science. Within the two groups, there was no significant difference of students' problem-solving efficacy.

As shown results in Table 2, the difference of problem-solving efficacy among male and female students at the each college was negligible in general. The results of Table 2 exhibited that male and female students at the University of Information Technology had similar in their problem-solving efficacy with $M = 3.06$.

Table 2. Means and Standard Deviations results of college students' problem-solving efficacy among three universities and gender

VNU-HCM members	<i>M</i>		<i>SD</i>	
	Male	Female	Male	Female
1. University of Technology	3.54	3.46	0.05	0.05
2. University of Information Technology	3.06	3.06	0.83	0.41
3. University of Science	3.28	3.20	0.60	0.58

The results of this study are different from previous studies of Luong (2010), MOET(2001), Nguyen (2005), and Vallelyand Wilkinson (2008) which showed that Vietnamese college students are weak in problem-solving efficacy. These studies were based on large scale surveys including public and private universities and even employment. The difference between this current study and the previous is probably due to the sample examined in the study is of better students. However, both this study and the previous indicated that the problem-solving efficacy of Vietnamese college students is unsatisfactory. Problem-solving is important for students to become effective problem solvers in their profession (Hamza& Griffith, 2006; Wilson, 1993) and for later career success (Froman, 2002; Gustin, 2001). Thus, Vietnamese government should invest more resources in enhancing problem-solving efficacy of all students in the process of constructing an instructional program. Unfortunately, there is yet no empirical research done about the relationship between academic disciplines and problem-solving efficacy of students in Vietnam or even in other parts of the world. The results of this study, thus, can not be compared to results of others. Further research about the relationship between academic disciplines and problem-solving efficacy of students will contribute to fill in the literature gap.

3.2. Vietnamese students' problem-solving efficacy affected by their college learning experiences

For the second research question, multiple regression method was used to answer how technical and scientific areas students of problem-solving efficacy affected by their college learning experiences. For the

whole sample, the results of Table 2 indicated that the regression model proposed by this study explained 18.1% of Vietnamese college students' problem-solving efficacy ($R^2 = 0.066$ to 0.405). However, the regression model wielded rather different explanation power for students' problem-solving efficacy among the three universities.

At the University of Technology, the results showed that item of student's background of class ranking ($\beta = 0.128, p < 0.05$), and levels of involvement in class activities ($\beta = 0.206, p < 0.01$), time spent on course work ($\beta = 0.131, p < 0.05$), and skipping class ($\beta = 0.161, p < 0.05$) significantly benefited students' problem-solving efficacy ($R^2 = 0.066$). At the University of Information Technology, teaching approach of employing multimedia ($\beta = -0.417, p < 0.05$) significantly hindered students' problem-solving efficacy ($R^2 = 0.405$). At the University of Science, level of involvement in class activities ($\beta = 0.204, p < 0.05$), time spent on course work ($\beta = 0.164, p < 0.05$), and frequency of consulting teacher ($\beta = 0.220, p < 0.05$) significantly empowered students' problem-solving efficacy ($R^2 = 0.179$). No other independent variable had significant effect on students' problem-solving efficacy.

Table 3. Regression analysis results among the dependent variable and independent variables at the whole sample and each college

Variable	The whole sample	University of Technology	University of Information Technology	University of Science
	Beta (β)			
<i>Student background</i>				
Class ranking	0.114*			
Family income				
<i>Teaching approach</i>				
One-way instruction				
Group Discussion				
Multimedia			-0.417*	
<i>Learning engagement</i>				
Levels of involvement in class activities	0.241***	0.206**		0.204*
Frequency of going to library				
Time spent on course work	0.160***	0.131*		0.164*
Frequency of consulting teacher				0.220*
Skipping class	0.108*	0.161*		
Adjusted R^2	0.181	0.066	0.405	0.179

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Vietnamese college students' problem-solving efficacy is significantly influenced by their college learning experiences. There are different affecting variables at different universities. Based on these differences, universities should design interventions to enhance students' problem-solving efficacy. As an example, University of Technology and University of Science may very well consider learning engagement, or University of Information Technology may want to avoid a teaching approach employing multimedia. The only variable across the universities is student involvement in class activities. In this study, involvement in class activities significantly affects on the problem-solving efficacy of students at two universities, namely University of Technology and University of Science. The research of Bossert showed that student involvement in class activities promoted student performances (Bossert, 1988). Specifically, recent meta-analyses suggested that student involvement in class activities benefited students at all age levels, of all subject areas, and for a wide range of tasks, such as those involving problem-solving efficacy (Johnson, Johnson, & Maruyama, 1983; Slavin 1983). In each university, in order to make a policy for the instructional program and to select a teaching method or to evaluate the studying result of the student, the experts or the program makers of VNU-HCM should be notably concerned about this factor. If we must decide a universal intervention to enhance problem-solving efficacy of students across the universities in Vietnam, it might very well be student involvement in class activities.

4. CONCLUSION

This study was to explore how learning experiences affect problem-solving efficacy of Vietnamese college students' technical and scientific areas. Results of this study found contribute to fill in the literature gap of Vietnamese college students' problem-solving efficacy development. The study also found that Vietnamese college students' problem-solving efficacy was below high. Thus, information provided in this

study helps administrators, faculty, and scientists at VNU-HCM should pay special attention to enhancing their students' problem-solving efficacy. VNU-HCM should evaluate their academic learning by the effect on improving students' problem-solving efficacy. This will help administrators, faculty, and scientists at VNU-HCM to monitor and adjust the strengths and weaknesses of the academic learning to meet the needs of the country. In the process of constructing an instructional program, administrators and scientists in the universities should design better institutional policies and select advanced academic learning to not only provide background knowledge, but also develop students' efficacy for future jobs. Many studies show that curriculum has a profound effect on student achievement and plays a crucial role in enhancing students' problem-solving efficacy.

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